**CLAIMS:**

1.      A method of testing a digital mobile phone network, the network comprising:

a communications network infrastructure, the infrastructure having a plurality of elements, including a plurality of radio communications base stations, and having interfaces between said elements; and

a plurality of mobile communications devices for radio communications with said base stations;

communications between a said mobile communications devices and said base stations, and signals on interfaces within the network infrastructure, comprising traffic and signalling data; the method comprising:

creating test traffic between a test one of said mobile communications devices and said communications network infrastructure;

measuring at least one parameter associated with said traffic to provide measurement data;

coding said measurement data representing said measured parameter into said test traffic;

demultiplexing traffic and associated signalling data for said test mobile communications device from traffic and signalling data for others of said mobile communications devices on a test interface selected from said infrastructure element interfaces;

decoding said measurement data from said demultiplexed traffic for said test mobile communications device; and

combining said decoded measurement data and said demultiplexed signalling data for said test mobile communications device to determine a response of said digital mobile phone network to said test traffic.

2.      A method as claimed in claim 1 further comprising:
interleaving said measurement data with said test traffic.

3.      A method as claimed in claim 1 wherein said creating and measuring comprise:

41

sending test data from said test mobile communications device to said communication network infrastructure;

receiving response data from said communications network infrastructure; and

measuring at least one parameter of said response data.

4.  A method as claimed in claim 3 further comprising establishing a packet mode data communications session, said establishing including determining a quality of service profile characterising a target quality of service for the session, said quality of service profile comprising at least one target parameter selected from a group comprising data rate, bit error ratio, and data delay parameters.

5.  A method as claimed in claim 3 wherein said measured parameter is selected from a group comprising data rate, bit error ratio, and data delay parameters.

6.  A method as claimed in claim 1 wherein said creating and measuring comprise:

establishing a voice mode connection with the communication network infrastructure;

sending audio test data from said test mobile communications device to said communication network infrastructure;

receiving audio response data from said communications network infrastructure; and

measuring at least one parameter of said audio response data; and wherein

said measurement data is inserted into said test traffic by encoding said measurement data as audio tones.

7.  A method as claimed in claim 6 wherein said measuring comprises comparing said received audio response data with said sent audio test data.

8.  A method as claimed in claim 6 wherein said establishing of a voice mode connection comprises making an outgoing call from said mobile communications device using said digital mobile phone network.

42

9. A method as claimed in claim 1 further comprising:

inserting test characterising data into said test traffic, said test traffic characterising data characterising the type of said test traffic;

decoding said test characterising data from said demultiplexed traffic; and combining said test characterising data with said decoded measurement data and said demultiplexed signalling data to determine a response of said mobile phone network to said test.

10. A method as claimed in claim 1 wherein the method comprises using an unmodified consumer mobile communications device as said test mobile communications device to simulate a subscriber to the digital mobile phone network.

11. A method as claimed in claim 1 wherein said demultiplexing of said traffic and associated signalling data at said test interface comprises:

recording substantially all the traffic and signalling data at said test interface; and demultiplexing said recorded traffic and signalling data to extract said traffic and associated signalling data for said test mobile communications from said recorded data.

12. A method as claimed in claim 11 wherein said demultiplexing of said traffic and associated signalling data at said test interface further comprises:

decoding said demultiplexed data according to a protocol stack associated with said test interface.

13. A method as claimed in claim 1 wherein said combining comprises recording said decoded measurement data and said demultiplexed signalling data in a data store in such a way that time series measurement data and corresponding signalling data are retrievable from the data store.

14. A method as claimed in claim 1 further comprising outputting a graphical representation of said combined data.

43

15.    A method as claimed in claim 1 wherein said test traffic comprises packet data traffic; wherein

packet data traffic communicated over a radio interface between a said mobile communications device and a said base station is dynamically allocated a variable level of radio interface resources; and wherein the method further comprises:

outputting a graphical representation of said combined data, said graphical representation providing a representation of said radio interface resources and of said at least one measured parameter over time to permit a comparison of said radio interface resources and said measured parameter.

16.    Mobile communications equipment for connecting to a mobile communications device for testing a digital mobile phone network, said mobile communications equipment comprising:

a mobile communications device driver having a traffic input for driving traffic to said mobile communications device and a traffic output for outputting a traffic received from said mobile communications device;

a test traffic supply to supply test traffic;

a traffic parameter measurer configured to receive an input from said device driver traffic output and to provide traffic parameter measurement data representing a measured traffic parameter; and

a combiner configured to combine said test traffic from said test traffic supply and measurement data from said traffic parameter measurer and to provide a combined traffic output to said traffic input of said device driver;

whereby, in operation, the equipment outputs traffic data comprising a combination of test traffic for testing said digital mobile phone network and traffic parameter measurement data to said mobile communications device, said traffic parameter measurement data representing a measured parameter of traffic received from said digital mobile phone network via said mobile communications device as a response to said test traffic.

17.    Mobile communications equipment as claimed in claim 16 wherein said combiner comprises an interleaver for interleaving said measurement data with said test traffic.

44

18.  Mobile communications equipment as claimed in claim 16 wherein said test traffic supply includes a data store to store said test traffic; and further comprising:

a test sequence controller configured to control said combiner and to control provision of said stored test traffic from said test traffic supply and of said measurement data from said measurer to said combiner, to control a test sequence of traffic provided to said traffic input of said mobile communications device driver.

19.  Mobile communications equipment as claimed in claim 16 wherein said device driver includes a voice device driver, said test traffic supply includes a data store to store digitised audio data, and said test traffic comprises audio test traffic, and wherein said traffic parameter measurer further comprises an encoder configured to encode said measurement data as audio tones and to provide said encoded measurement data to said combiner for combining with said audio data from said data store; whereby said combined traffic output comprises audio data.

20.  Mobile communications equipment as claimed in claim 19 further comprising an autocaller to control said mobile communications equipment to automatically initiate outgoing calls using the digital mobile phone network.

21.  Mobile communications equipment as claimed in claim 16 wherein said device driver includes a data device driver and said test traffic comprises packetised data traffic.

22.  Mobile communications equipment as claimed in claim 21 wherein said test traffic supply and said traffic parameter measurer each have a data packetiser for supplying packetised data to said device driver; and further comprising:

a test sequence controller configured to control said traffic supply packetiser and said parameter measurer packetiser to control a test sequence of traffic provided to said device driver.

23.     Mobile communications equipment as claimed in claim 21 wherein said measured traffic parameter is selected from a group comprising data rate, bit error ratio, and data delay parameters.

24.     Mobile communications equipment as claimed in claim 16 wherein said device driver is suitable for driving an unmodified consumer mobile communications device, to simulate a subscriber to said digital mobile phone network.

25.     Mobile communications equipment as claimed in claim 16 comprising a processor and an instruction store storing instructions for controlling the processor to provide said mobile communications device driver, said test traffic supply, said traffic parameter measurer, and said combiner.

26.     A combination of the mobile communications equipment of claim 16 and said mobile communications device.

27.     Computer readable program code to, when running, implement the functions of the mobile communications equipment of claim 16 on a computer system.

28.     A carrier medium carrying the computer readable program code of claim 27.

29.     A carrier medium carrying computer readable code for controlling a computer coupled to a mobile communications device to test a digital mobile phone network, the code comprising computer code for:

        a mobile communications device driver having a traffic input for driving traffic to said mobile communications device and a traffic output for outputting a traffic received from said mobile communications device;

        a test traffic supply to supply test traffic;

        a traffic parameter measurer configured to receive an input from said device driver traffic output and to provide traffic parameter measurement data representing a measured traffic parameter; and

a combiner configured to combine said test traffic from said test traffic supply and measurement data from said traffic parameter measurer and to provide a combined traffic output to said traffic input of said device driver;

whereby, in operation, the computer outputs traffic data comprising a combination of test traffic for testing said digital mobile phone network and traffic parameter measurement data to said mobile communications device, said traffic parameter measurement data representing a measured parameter of traffic received from said digital mobile phone network via said mobile communication device; as a response to said test traffic.

30. A method of using a mobile communications device to facilitate testing of a digital mobile phone network, the method comprising:

controlling said mobile communications device to send test traffic over said digital mobile phone network;

receiving traffic from said digital mobile phone network using said mobile communications device;

measuring at least one parameter associated with said received traffic to provide traffic parameter measurement data; and

inserting said traffic parameter measurement data into said test traffic, to thereby facilitate testing of said digital mobile phone network.

31. A method as claimed in claim 30 further comprising:

providing test traffic data from a test traffic data supply;

coding said test traffic data for transmission over the digital mobile phone network;

coding said measurement data for transmission over the digital mobile phone network;

interleaving said coded test traffic and measurement data; and

providing said interleaved data to a mobile communications device driver for controlling said mobile communications device to send said interleaved data over said digital mobile phone network.

47

32.     A method as claimed in claim 31 further comprising:

controlling said coding of said test traffic data, said coding of said measurement data and said interleaving using a state machine.

33.     A method as claimed in claim 31 wherein said test traffic comprises audio test traffic and said coding comprises audio coding.

34.     A method as claimed in claim 31 wherein said test traffic comprises packet data and said coding comprises packetizing said test traffic data and said measurement data.

35.     Computer readable program code to, when running, implement the method of claim 30 on a computer.

36.     A carrier medium carrying the computer readable program code of claim 35.

37.     Test equipment for testing a digital mobile phone network, the network comprising:

a communications network infrastructure, the infrastructure having a plurality of elements, including a plurality of radio communications base stations, and having interfaces between said elements; and

a plurality of mobile communications devices for radio communications with said base stations;

communications between a said mobile communications devices and said base stations, and signals on interfaces within the network infrastructure, comprising traffic and signalling data; the test equipment comprising:

an input to receive data collected at a test one of said interfaces, said received data comprising traffic and signalling data for mobile communications devices using said network;

a demultiplexer to identify test traffic and associated signalling data for a test one of said mobile communications devices from said received data;

a decoder to identify measurement data representing at least one measured parameter associated with said test traffic embedded in said test traffic; and

48

a data store to store at least said test traffic signalling data in association with said measurement data in such a way that time series measurement data and corresponding signalling data are retrievable from the data store.

38.     Test equipment as claimed in claim 37 further comprising:

an output device to output a graphical representation of said time series measurement data and said corresponding signalling data.

39.     Test equipment as claimed in claim 38 wherein said test traffic comprises packet data traffic; wherein

packet data traffic communicated over a radio interface between a said mobile communications device and a said base station is dynamically allocated a variable level of radio interface resources; and wherein

said graphical representation provides a representation of said radio interface resources and of said at least one measured parameter over time to permit a comparison of said radio interface resources and said measured parameter.

40.     Test equipment as claimed in claim 37 wherein said traffic comprises packet data traffic and wherein said measured parameter is selected from a group comprising data rate, bit error ratio, and data delay parameters.

41.     Test equipment as claimed in claim 37 wherein said demultiplexer includes a decoder to decode a protocol stack associated with said test interface.

42.     Test equipment as claimed in claim 37 comprising a processor and an instruction store storing instructions for controlling the processor to provide said input, said demultiplexer, said decoder and said data store.

43.     Computer readable program code to, when running, implement the functions of the test equipment of claim 37 on a computer system.

44.     A carrier medium carrying the computer readable program code of claim 43.

49

45.    A carrier medium carrying computer readable code for controlling a computer to test a digital mobile phone network, the network comprising:

a communications network infrastructure, the infrastructure having a plurality of elements, including a plurality of radio communications base stations, and having interfaces between said elements; and

a plurality of mobile communications devices for radio communications with said base stations;

communications between a said mobile communications devices and said base stations, and signals on interfaces within the network infrastructure, comprising traffic and signalling data;

the code comprising computer code for providing:

an input to receive data collected at a test one of said interfaces, said received data comprising traffic and signalling data for mobile communications devices using said network;

a demultiplexer to identify test traffic and associated signalling data for a test one of said mobile communications devices from said received data;

a decoder to identify measurement data representing at least one measured parameter associated with said test traffic embedded in said test traffic; and

a data store to store at least said test traffic signalling data in association with said measurement data in such a way that time series measurement data and corresponding signalling data are retrievable from the data store.

46.    A method of processing data from a digital mobile phone network to facilitate testing of the network, the network comprising:

a communications network infrastructure, the infrastructure having a plurality of elements, including a plurality of radio communications base stations, and having interfaces between said elements; and

a plurality of mobile communications devices for radio communications with said base stations;

communications between a said mobile communications devices and said base stations, and signals on interfaces within the network infrastructure, comprising traffic and signalling data,

the method comprising:

inputting data from a test one of said interfaces, said inputted data comprising traffic and signalling data for mobile communications devices of said plurality of mobile communications devices;

demultiplexing said inputted data to identify test traffic and associated signalling data for a test one of said mobile communications devices;

identifying measurement data representing at least one measured parameter associated with said test traffic embedded in said test traffic; and

storing said test traffic signalling data in association with said measurement data so as to be able to retrieve a time series of measurement data and the corresponding test traffic signalling data.

47. A method as claimed in claim 46 further comprising:

outputting a graphical representation of said time series of said measurement data and the corresponding signalling data.

48. A method as claimed in claim 47 wherein said test traffic comprises packet data traffic; wherein

packet data traffic communicated over a radio interface between a said mobile communications device and a said base station is dynamically allocated a variable level of radio interface resources; and wherein

said graphical representation provides a representation of said radio interface resources and of said at least one measured parameter over time to permit a comparison of said radio interface resources and said measured parameter.

49. A method as claimed in claim 46 wherein said traffic comprises packet data traffic and wherein said measured parameter is selected from a group comprising data rate, bit error ratio, and data delay parameters.

50.     A method as claimed in claim 46 wherein said demultiplexing further comprises decoding a protocol stack associated with said test interface.

51.     Computer readable program code to, when running, implement the method of claim 46 on a computer.

52.     A carrier medium carrying the computer readable program code of claim 51.

53.     A system for testing a digital mobile phone network comprising the mobile communications equipment of claim 16 for testing a digital mobile phone network and test equipment; the network comprising:

a communications network infrastructure, the infrastructure having a plurality of elements, including a plurality of radio communications base stations, and having interfaces between said elements; and

a plurality of mobile communications devices for radio communications with said base stations;

communications between a said mobile communications devices and said base stations, and signals on interfaces within the network infrastructure, comprising traffic and signalling data; the test equipment comprising:

an input to receive data collected at a test one of said interfaces, said received data comprising traffic and signalling data for mobile communications devices using said network;

a demultiplexer to identify test traffic and associated signalling data for a test one of said mobile communications devices from said received data;

a decoder to identify measurement data representing at least one measured parameter associated with said test traffic embedded in said test traffic; and

a data store to store at least said test traffic signalling data in association with said measurement data in such a way that time series measurement data and corresponding signalling data are retrievable from the data store.

54.     A carrier medium carrying computer readable code for testing the performance of a mobile communications system as perceived by a subscriber to the system using a

52

subscriber mobile communications device, the computer readable code comprising code for running on a computer system coupled to said subscriber mobile communications device, said code being for controlling the computer system to:

send traffic over said mobile communications system using said subscriber mobile communications device, said traffic including test traffic and coded information; and to

code said coded information to allow said information to be identified within said traffic and extracted from said traffic; and

wherein said information comprises information relating to a test activity performed by said computer system.

55. A carrier medium as claimed in claim 54 wherein said traffic comprises data traffic and said information is selected from a group comprising data throughput rate, data delay and subscriber mobile communications device position.

56. A carrier medium as claimed in claim 54 wherein said traffic comprises voice traffic, wherein said coding comprises encoding said information using audio tones, and wherein said information is selected from a group comprising voice quality information and subscriber mobile communications device position.

57. A carrier medium carrying computer readable code for analysing the performance of a mobile packet data communications system, the mobile packet data communications system including a plurality of base stations for radio communication with a plurality of mobile communications system devices, the system being logically divided into portions linked at interfaces at which measurements may be made; the computer readable code comprising code to, when running, analyse data captured at a said interface, said code being configured to control a computer system to:

read data captured at a said interface;

extract traffic data and associated mobile communications system operation information for one of said communications devices from said read data;

decode coded information from said traffic data; and

output a linked combination of said decoded information and said mobile communications system operation information associated with said traffic from which said information was decoded.

58. A carrier medium as claimed in claim 57 wherein said code is further configured to control said computer system to provide a graphical representation of said decoded information and said mobile communications system operation information associated with said traffic from which said information was decoded.

59. A method of testing the performance of a mobile communications system as perceived by a subscriber to the system using a subscriber mobile communications device, the mobile communications system including a plurality of base stations for radio communication with a plurality of mobile communications system devices, the system being logically divided into portions linked at interfaces at which measurements may be made; the method comprising:

sending traffic over said mobile communications system using said subscriber mobile communications device, said traffic including test traffic and coded information, said coded information being coded to allow said information to be identified within said traffic and extracted from said traffic, said information comprising information relating to a test activity performed by said computer system;

capturing data at a said interface;

extracting traffic data and associated mobile communications system operation information for one of said communications devices from said captured data;

decoding said coded information from said traffic data; and

outputting a linked combination of said decoded information and said mobile communications system operation information associated with said traffic from which said information was decoded.

60. A method as claimed in claim 59 wherein said outputting comprises outputting a graphical representation of said decoded information and said mobile communications system operation information associated with said traffic from which said information was decoded.

54